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Success Story

ON-LINE OIL CONDUCTIVITY SENSOR WILL PROVIDE REAL-TIME MONITORING

With the aging of current engine fleets and advanced engines coming into the inventory within the next decade, the jet engine conductivity sensor will provide the needed capability for real-time monitoring of oil condition, allowing more cost-effective maintenance and preventing catastrophic lubrication system failures. It is undergoing testing for use on next generation turbine engines and has been included in the seeded-fault engine test performed by the Joint Strike Fighter (JSF) program.

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Accomplishment

The Propulsion Directorate's Sciences and Advanced Concepts Division sponsored a program with the University of Dayton Research Institute that resulted in the development of unique conductivity sensor technology for monitoring jet (gas turbine) engine lubrication systems. The new conductivity sensor, which weighs less than a pound and is mounted directly in the engine lubrication system, continuously monitors thermal degradation of gas turbine oils and is capable of withstanding harsh turbine engine environments of up to 5 years.

Background

Directorate researchers discovered in the early 1990's that conductivity measurement was a much more sensitive and reliable indicator of synthetic ester-based oil thermal degradation than standard techniques, such as total acid number and viscosity measurement. The technology was taken from a rudimentary idea and developed into an on-line device. The sensor underwent bench-scale, lab simulator, and full-scale T63 engine testing in Directorate facilities, utilizing a wide range of ester oils at various levels of thermal degradation during its development phase. The response and performance of the conductivity sensor is extremely sensitive to the onset of thermal degradation and is being tested in two modes. One type of sensor is immersed in the oil flow stream to measure the bulk oil thermal degradation level, while a slightly modified version is embedded in the surface of an oil line or other system "hot spot" to measure the build up of oil deposits, known as coking. Excessive bulk degradation and coking are currently two of the largest cause of oil system failures and unscheduled maintenance actions in many types of turbine engines. The conductivity sensor, in both modes, can help prevent these failures and predict exactly when oil system maintenance is needed. This technology is foreseen to have application in miliary, commercial and general aviation, as well as in the utility power generation industry, and for other users of synthetic ester-based lubricants.

Additional information

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